RVator's Log

Newsletter of the Twin Cities RV Builder's Group

June 2019

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Upcoming Events

Twin Cities RV Builders Hangar Party:

July 14, 2019 – Bernie Weiss' hangar, Anoka Airport, Blaine, MN

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Minnesota Wing
Van's Air Force

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Shop Notes

- Doug

I truly cannot remember the first light airplane I flew that was equipped with an autopilot. They just didn't exist back in the 60's and 70's and if you did stumble across an airplane with an autopilot it probably didn't work. Besides real pilots didn't need any dumb autopilot anyway. The concept of letting "George" fly my airplane was blasphemy. No bundle of wires and tubes (pre-transistor days!) could fly better than I could!

When I first started building my RV-4, the thought of an autopilot never crossed my mind. Of course there really wasn't a functional and affordable model available that was designed for a small homebuilt. But why would I have one?

Shortly after finishing the -4, I began to venture out on some longer cross-country trips. The -4 was fast and efficient and there was no reason not to do some traveling. However the front office is not exactly a spacious environment. I recall starting out one morning armed with a stack of sections crammed down by my knees and a banana in my shirt pocket. Settling down in cruise, any attempt to unfold a chart or even peel my banana resulted in some crazy aerobatic excursions. Once the air got rough, it was NOT fun. What made the -4 a great handling airplane when playing fighter pilot, made it a total pain on a bumpy cross country.

And then along came TruTrak….

Some of you "oldsters" may remember that in the 90's the club sponsored the Twin Cities RV Forum. This was a big deal for us back then and we arranged a number of well-known speakers for this daylong event. One year, Jim Younkin was one of our guests. At that time, Jim was president of Tru Trak Flight Systems, which had recently developed a simple, light, and inexpensive autopilot for amateur built aircraft. Jim was quite a character and also an electronic genius. He essentially had invented the practical autopilot for factory built aircraft (Century Flight Systems). He explained to me how his Digi-Trak autopilot used a combination of digital accelerometers used on BMWs and GPS track information to provide accurate attitude information to simple pitch and roll servos. It didn't take too long before I was convinced and bought a system for my RV-4. I was amazed at how it worked so effectively and turned my squirrelly RV-4 into a comfortable cross-country traveler.

Today I would never own an RV without an autopilot and especially a Tru Trak autopilot. One major advantage is that it is completely independent of any other system in the airplane. In other words,

you can lose all of your EFIS systems and even your GPS and it will keep you right side up. The DigiFlight II that I have in my current RV-7 tracks a GPS course perfectly, has altitude pre-select, trims the airplane automatically, and can shoot a GPS VNAV approach literally right down to the runway. Absolutely mandatory equipment!!

Sadly, in March of this year Jim Younkin passed away at age 90. He was a remarkable genius who transformed the world of flight control automation for light aircraft (and he was an amazing aircraft restorer s well. Andy Barker, president of Tru Trak wrote this piece in memory:

It is with great sadness and sorrow that I write this tribute to one of the greatest contributors to safety in the history of general aviation. Scratch that, it is with great admiration and fondness that I write this. Jim Younkin, co-founder of TruTrak Flight Systems, has been creating safety-enhancing technology for over half a century. My friend, mentor, and previous business partner, passed away on May 13. He was 90 years young!

Jim has had at least three full careers in aviation. He began by designing some of the very first attitude and directional gyros for general aviation. He then moved into autopilots and the HSI.

Jim Younkin, center

Once he retired from that career he became, in his own words, "a compulsive aircraft builder". He built the Mr. Mulligan, Travelair Mystery ship, converted several Staggerwings from D to G models (with numerous special modifications to those aircraft), he also designed and built the Mullicoupe (an aircraft that combines the Mr. Mulligan and the Monocoupe). He also extensively modified several other aircraft designs.

After winding down the aircraft-building phase, he co-founded TruTrak. Once again he found himself designing autopilots and other related items. TruTrak was founded in 1999. During that time he was the brain behind many of our products. One of my favorite memories is that many of our product names were actually inside jokes between him and I. In 2014 I purchased TruTrak from him, and he fully stepped away from the company.

Without Jim, TruTrak would not exist and I would not have the knowledge or ability to have created any of the products we sell today.

Tailwinds my friend, and thank you for education and for your wonderful contributions to aviation.

Andrew Barker
President / CEO
TruTrak Flight Systems

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Elevators!!!!!

- Walt Aronow, from Van's Air Force

Part 1:

Why is it that so many folks can't seem to get this right, it's so simple but I find it incorrect so often its amazing

Today during a condition inspection, on a nicely built 8, I find all the elevator attach bolts loose (rod end to hinge), as soon as I find this I know what's coming... no or incorrect spacing on the center support bearing. Sure enough when I tightened all the bolts down so the rod end bearings can actually act like bearings rather than bushings, the elevator is locked up tight. Loosen the center bearing and voila the elevator comes back to life (actually because the bearings had not been acting as bearings for so long it took lots of lube and working them back an forth to free them up).

Then I check to see what was used for spacers and guess what, none there, nata, zippo... no spacers at all, not even a single lowly washer!

So now I am tasked with making the correct size spacers for the center bearing, not an easy task at this point unless I also want to remove the rudder (which by the way all those bolts were loose too and same situation with frozen bearings).

The process is simple when installing the elevator:

1.) Tighten up all the elevator attach points except the center bearing. **Hinge bolts SHALL NOT be loose!** Elevators should move freely.

2) Make the correct (exact) size spacers out of tubing or whatever you prefer for both sides of the center bearing (they will be different sizes).

3) Install spacers made in step 2 and tighten down center bolt; elevators should remain free just like they were in step 1.

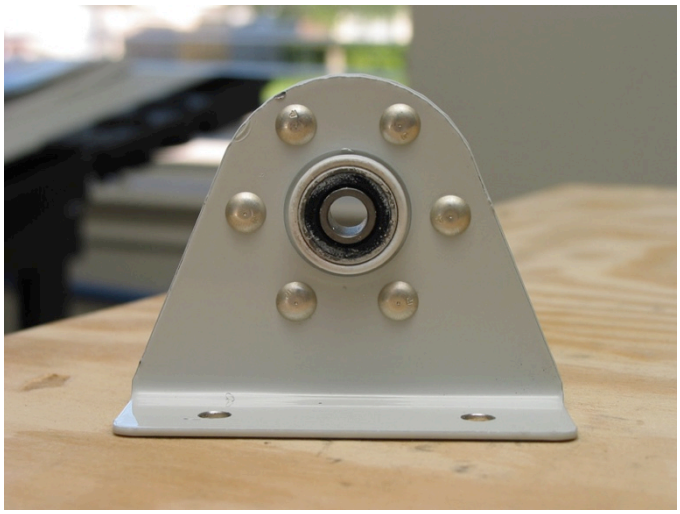
If the elevator binds up, return to step 2. Do not loosen hinge bolts in order to free up elevator!

I literally find this condition on 75% or more of the aircraft I inspect. It seems that when folks find things binding their answer is to just loosen up the bolts

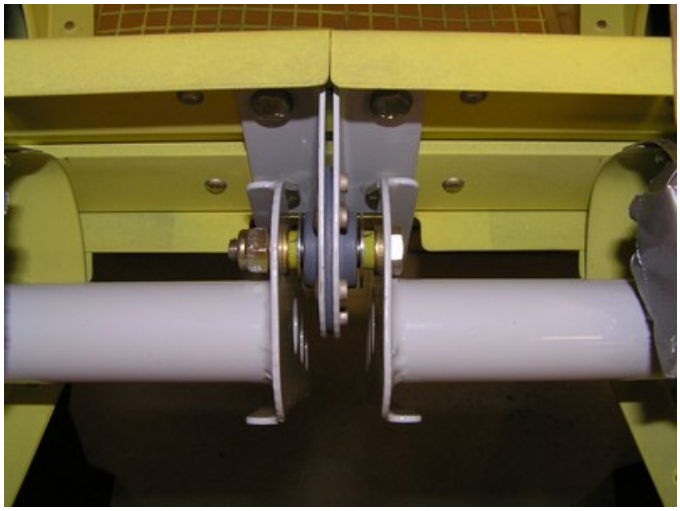
Rod end bolt SHALL be tight (torqued) so that the bearing can actually work as a bearing.

Part 2:

The center bearing is basically just a sealed bearing; the inner race is locked in place to the elevators with the bolt and spacers while the elevator support bracket retains the outer race.



If the spacers are not a perfect fit on both sides of the bearing when you tighten the bolt it will try to pull the elevators together placing a side load on the outer and middle rod end bearings. That is what causes the binding.



When I get the outer and middle rod ends adjusted correctly then I use a feeler gauge set to measure the gap between the elevator horn and the bearing on each side and make spacers to fit. Sometimes you get lucky and a combination of washers

will work, other times you have to make a custom spacer from aluminum tubing to get the exact dimension you need.

When you get it all set up correctly **all the bolts are tight** and the elevator floats like a butterfly!!!!

Let's get Practical

- Doug

I often get phone calls from potential builders who are contemplating building an RV. Sometimes you can tell that the caller is not that well informed or maybe just hasn't contemplated what it really means to roll your own flying machine.

I list the usual reasons why an RV is a great kit to build: a solid company that is going to be there tomorrow, a variety of models to choose from, great factory support and a huge community of builders…. the list can go on and on.

But then we have to have "the talk." Time to discuss the practicalities of building and consider some hard facts:

1. This is going to take a BIG chunk out of one's life. I have built two RV's and each took about 2500 hours of work. Hmm.. how much time is that really? My RV-4 took me 11 years to build!! My excuse was that my kids were small and I didn't work that hard at it. When I retired and decided to build an RV-7, I figured I'd finish it in a couple years because I could work at it full time. Well...it was 4 and a half years of "full time" work because life always gets in the way. This is an all-encompassing hobby. Way different from going fishing once in a while, building a couple birdhouses, or collecting saltshakers. One has to really sign on to the time commitment that RV building requires.

2. The family has to be on board. If there is a spousal unit involved, he or she needs to have your back. You will spend a LOT of time out in the shop, which can take away from the family and it's best to have all the cards on the table before diving too deeply into this project.

3. It's going to cost a LOT of money. Aviation has never been a hobby for the fiscally faint of heart. I can recall when I first became interested in homebuilt airplanes, most people built to save money. They would scrounge the Fly Market at Oshkosh for bargain basement parts looking for gently used radios, instruments, wheels, tires, etc. etc. Airplanes were built from a set of plans, which meant scrounging from a myriad of sources. Today, a company like Van's is a one-stop shop for just about everything you need to build and the majority of builders now want all new components. If you go that route, it's pretty easy to end up with $100,000 plus in your project. Not an insignicant number!!

4. Where do I build it? My first attempt at building an airplane was a Thorp T-18. We had just got married and we lived in a small studio apartment. I recall dragging a roll of stock aluminum, a pair of tinsnips and a file down to the basement laundry room to attempt to hack out some aileron parts. Needless to say, I didn't get too far and gave up. I've seen RVs built in the dining room but you really want a warm, well-lit dedicated space. A separate shop is nice. Basements can work. So too with a garage (but don't relegate the spouse's car to sitting outside in the winter – poor planning!) Some people want to immediately build or rent a hangar at the local airport. Maybe not the best of ideas, because you really want your project at home. You will work on it more when it is close by. Driving out the airport takes time and effort.

5. Lastly, are you a builder or a flyer? I found building a great challenge. Are you patient and disciplined? Building an RV requires a mind-set to adhere to aviation standards of workmanship. Do you get discouraged easily? Yes, you will make a number of bone-headed mistakes and yes; you will have to buy replacement parts to fix your goofs (I still have a box of ruined RV-4 parts in my basement!). But if you just want a RV aircraft to fly, maybe finding a ready-built example is your choice. There are lots of them out there but each is quite different and it's buyer beware.

I can look back and say building an RV was one of my life's major accomplishments. I still marvel I really did it. The journey can be long and frustrating at times, but the rewards are great. Just consider all the practical aspects but don't be deterred. You will never regret it!

Yes, you can do it!!!!

- Michael Stewart, from Van's Air Force

Ever look around the chapter and wonder how these normal people interested in aviation do extraordinary things, like build an airplane? I did. I mean, really, get into a machine that you put together and fly it? Can that be? It can. I did. And so can you.

I came to the table not unlike you. Sure, I had some skills...I had an unused engineering degree, some toying around with model R/C planes, and a huge interest in aviation. Aluminum? What's that? Avionics, riveting, dimples, manifold pressure? It was all Greek to me. But what I had was a burning desire to get into something I built and fly it. And once I had the idea in my head, there was no turning back. My dream was committed - but was I?

I started, being the computer geek I am, by surfing the web. I had a few key elements to consider: budget, speed, aerobatics, ease to build, proven design, and minimal effort on fiberglass. With these in mind the Van's series of aircraft became the obvious choice. I did not want to reinvent the wheel. I wanted to build it myself, but not everything, and not from scratch - kind of middle of the road on the amount of skill required. What I absolutely did not want was to beat my head against the wall and end up on the wrong side of the statistic of 1 in 15 that start, finish. Failure was not an option. With this in mind, the RV-6A stood out for me. Hundreds flying, aluminum, well proven, good directions, pay as you go, and lots of resources and people to ping off of.

When I ordered my tail kit, can you believe I had not even seen one of these planes in person? I'm serious. I knew nothing of the EAA, and had no clue that just 10 minutes from my house were 6 RV's sitting in hangers with pilots ready to give me a ride. I soon found the 690 Chapter and got my first ride in an RV with Clyde Schnars. With my horizontal stab completed and the elevators sitting in the jig, I got my dream ride.

What really stuck in my mind when the wheels left the ground on that first flight was, WOW, I made the right decision. It was smooth, fast and comfortable. I had a grin from ear to ear. That was the catalyst for me to stay focused on the job at hand and there was no question after that flight, I was going to finish this plane. Thanks Clyde.

Back in the garage, progress went pretty fast. What I found was that this was not one project of building a plane, it was a thousand little projects that ended up being a plane in the end. If I looked too far ahead I got discouraged. If I focused on the task at hand and just kept plugging at it, things would get done and progress was always happening. Things were not always done perfectly, I am no perfectionist. I would still be working on the plane if I were.

Many screw-ups were to be had - and I had some dooseys. You will to. For instance, I destroyed a set of tank ribs because I was not paying attention to the plans. The plans showed where circles were punched in for strength. I thought it was circles for holes to be cut so fuel could move from section to section. DUHH! I messed up an aileron because I forgot to put the trim servo in while building it. DUHH! I put aluminum angle in for stringers on the fuselage where J channel was supposed to go. DUHH! And the real doosey was putting the support structure in for the wing spar with the wing incidence backwards. The wings ended up with 3 inches off the thrust line. How did that happen? Well when you build the fuse, you build it upside down. When I made my measurements to drill and rivet the bulkhead in that holds the wing spar, I did not take into consideration that the fuse was upside down. @$#%#@!! That one really made me mad. And there were others - too many to list. Recently Dave Henderson, a chapter member who just started to build his RV-7, primed his parts with zinc chromate just like the diligent builder should. Except for one thing, he did not know that paint like that requires a hardener additive. Funny huh? He didn't know. He read, "prime with Zinc Chromate," and that's what he ordered and that's what he put on. HA! Funny? Yes. Frustrating? Yes. Part of building? Absolutely! There are many pit falls to be had, and you will find some no one else has. The key is, can you accept those challenges and realize your dream of flight? Yes, you can. I did.

There are several key components to my success that without them, I don't think I could have realized my dream. First is this chapter. I had no fewer that 12 technical counselor visits. I received free advice from guys who know what to look for. I met chapter friends who reached out to help a lending hand, which I now consider family. Now we go to dinner and fly together. A match made in heaven. Who knew? Not to mention I got involved with the chapter and kept my aviation blood warm while I kept pounding those rivets. Second was the Internet. Many times, I would stare at the plans and try to vision some little do-dad I was supposed to fabricate and I just could not picture it. The web turned a 2 dimensional plan on a piece of paper into an object I could see. Those pictures on the web of guys who have taken the time to show you and me what some of these little parts look like are not worth a thousand words, they are worth hours of your eyes rolling into the back of your head staring at plans and many grey hairs. I suppose being single with no kids did not hurt my success rate either. I had few distractions. Third was a burning desire to do something few people get the opportunity to do. Build a plane and fly it? Do you have that burning desire? I did.

That first flight came and it was truly a dream come true for me. I had friends and family with me that day to realize it and

Share it with me. I will never forget it. And after 6 weeks and 115 hours of flying later, I cannot imagine not having done this in my life. My new little best friend has carried me, friends, family, young eagles, strangers, and my dog, Casey, to far-off places I would not have seen otherwise. I have been to both southern coasts of Florida to visit my dad, to thank him for giving me the skills to do this. I have gone to lunch in little places like Gatlinburg and Hilton Head. I have had the opportunity to put grins on strangers' faces whilst turning them upside down. I shoot to 5000 feet with some smooth James Taylor playing "Going To Carolina In My Mind" followed by Kansas' "Dreamweaver", while performing some gentlemen's aerobatics. Can't you hear the song playing now and see the little plane rolling through the sky? It's my favorite place to be in the world. Where is yours? I'll bet its up there too, else you would not be staring at every plane that flies overhead and wonder, "What kind of airplane is that, and what is he up to?"… if only for a moment. I do, and I know you do too.

Through it all, I never lost site of the dream. Focused, determined, diligent, and committed are just a few of the characteristics I had that led to the first flight. You have these in you too. Can you pull them all together and realize your dream? I did. You can.

Oh, painting…. UGH!!!

- Doug

One tenant that is preached in the building process is not to think too far ahead. You can get overwhelmed pretty quickly contemplating what avionics you want while you are trying to figure out how to de-burr your first rivet hole.

But fairly early on you should consider what color you are going to paint the interior of the fuselage. This is a step that is best to do when the fuselage is in the "canoe" stage when the interior is accessible and you have not installed any components that would get in the way.

This then requires some thought as to what color upholstery you might like which leads to what colors the exterior will be and suddenly you are thinking TOO far ahead again. You can generally resolve this by using a rather generic interior paint color that will go with pretty much any color upholstery and exterior color. I would say this boils down to a light gray or beige. The gray seems very popular (Van uses a very adaptable shade for the powder-coating of steel parts). Personally I preferred a beige color as I feel this makes the interior appear larger (darker colors seem smaller and confining, lighter seems open and airy).

If you analyze it, you really don't have to paint all that much of the interior because the upholstery will cover quite a bit. I masked off the anticipated exposed parts of my fuselage and first cleaned all the surfaces with PPG oil and grease remover. I then scuffed everything with purple Scotch Brite pads. Then I cleaned again with the oil and grease remover and the surface was ready to spray.

One part of my shop was a crude paint booth, which would provide a fairly clean environment. I had decided to use Sherwin Williams Jet Flex for an interior paint. In some respects it is easy to use in that it is catalyzed by distilled water and doesn't contain the nasty chemicals found in regular type paint. The downside is that it is a thicker paint, which requires a larger spray nozzle to make it work. I used good old NAPA 7220 for a primer (just about any topcoat adheres to it.) I went through several rattle cans and the prime coat came out fine.

Sprayed with NAPA 7220 self-etching primer

Spraying the Jet Flex is fairly straightforward. The overspray is minimal and it dries in just a minute. The downside is that you must clean your spray gun immediately with distilled water as the paint catalyzes and sets up quickly. Once dry Jet Flex is very hard yet I found that the light color would mark up fairly easily. Any errant marks seemed to be removed easily with alcohol or very fine sandpaper. I later determined those areas that might be exposed to scratches like the canopy rails. I covered them with 3M clear protective film and to this day, those areas are scratch free.

Sherwin Williams Jet Flex interior paint

The final interior. Steel parts such as the canopy frame were powder coated to match the Jet Flex

If had it to do over again, I'm not sure I would use Jet Flex. Perhaps a plain old single stage PPG paint might be easier to apply. Do some research when you get to that stage of the game and try some test panels to determine what works best for you.

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TC RV Builders Summer Hangar Party

Sunday, July 14, 2019, 1:00 pm

Bernie Weiss' hangar – India Lane
Anoka Airport, Blaine, MN (KANE)

Join us for our annual summer hangar party as guests of Bernie Weiss and Pete Howell. The process is the same as years past. Members are encouraged to bring along a guest and fly-ins are especially invited. Feel free to come by around noon and we'll start official eating at one. We have a couple special guests planned that will speak around 2 pm so please plan to stick around. ***This will be a very special event so consider it a mandatory meeting!!!***

Bring along a camp chair for your dining comfort. We'll be asking for a head-count, as we get closer to the date so be on the look out for an email that will have all the details.

For fly-ins:

You can park at the north end of the hangar line (ask for taxi instructions to "Fox Hollow" at the west end of the airport (taxi lane "India")) or on the grass on India Lane opposite the hangars.

For drivers:

From Rte 65: Turn east on 93rd Lane NE. Turn left at airport entrance (gate code 12185). Turn right at T intersection then immediate left on India Lane.

From I35W and Rte 10: Go west on Rte 10 and exit on 93rd Lane. Turn right and take second airport entrance to the right and follow directions above.

Please park on grass or hard surface clear of hangar doors!!!!!! Questions: Call Doug at 651-398-1184